REPORT

ON THE

Partabgarh Agricultural Station

OF THE

UNITED PROVINCES OF AGRA AND OUDH.

FOR THE YEAR ENDING JUNE 30th, 1910.

ALLAHABAD:

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From

W. H. MORELAND, Esq., C.I.E., I.C.S.,
Director of Land Records and Agriculture,
United Provinces,

To

The CHIEF SECRETARY to GOVERNMENT,
United Provinces.

Dated Partabgarh, the 31st October 1910.

Sir,

I have the honor to submit the report on the Partabgarh Agricultural Station for the year ending 30th June 1910.

The report has been drawn up by the Assistant Director in charge of the Eastern Circle.

I have the honor to be,
Sir,
Your most obedient servant,
W. H. MORELAND,
Director.

Report on the Partabgarh Agricultural Station for the year ending 30th June 1910.

(I) SITUATION, HISTORY AND OBJECTS.

The farm is situated in the villages Karanpur, Lukha and Sagra, about one mile and a half west of the Partabgarh Oudh and Rohilkand Railway Station, about one mile from the Belha town and less than half a mile from the Partabgarh collectorate. The pakka road from the Collectorate to Katra runs along the eastern boundary of the farm. On the west it extends up to the pukka road running from the civil courts to fort Partabgarh.

The area of the farm is 89·8 acres, of which 65 acres are under cultivation, and the rest is occupied by roads, groves, buildings and tanks. The land was acquired in 1906, and in that year the levelling of uneven areas and construction of buildings were taken up, the cultivated area being sown principally with food crops. The farm is meant chiefly for experiments on different varieties of rice, maize, wheat and sugarcane, but at present the cultivation of these and other staples is carried on mainly with a view to determining the suitability of the soil to the various crops and their varieties, and the degree of fertility of the various plots which it is intended to devote to actual expriments. Within the farm there is a *jhil* which stretches from south-east to north-west. In the greater portion of the *jhil* water stands throughout the rainy season and in some parts of it till winter, unless utilized for irrigation of the rice crop. The area adjoining the *jhil* is transplanted with late rice. The cultivated land is all irrigable from wells; three of which have been built since the acquisition of the farm and two are old which were originally constructed by the zamindars who owned the land. The farm comprises nearly all classes of land ordinarily met with in the south of Oudh: heavy clay (matiar), suitable for rice, light and heavy loams (dumat) and the poorer kind known as bhur, sandy or interspersed with kankar and bajri (nodulated lime-stone). Samples of soil and sub-soil were analysed by Mr. G. Clarke, the Agricultural Chemist of the Department, two years ago, and the results of the analyses are given below :—

Analyses of loam soil and sub-soil No. I A. and No. I B.

	No. I A. Loam.	No. 2 A. Loam (sub-soil).
Insoluble matter, soluble and insoluble silica	87·80	85·15
Potash (K_2O)	0·36	0·48
Lime (CaO.)	0·47	0·53
Magnesia (MgO.)	0·89	1·01
Manganese Oxide (MnO.)		
Ferric Oxide (Fe_2O_3)	5·99	7·88
Alumina (Al_2O_3)		
Phosphorus Pentoxide (P_2O_5)	0·20	0·21
Organic matter	3·44	3·47
Combined water	0·64	1·02
Undetermined (soda and traces of chlorine and sulphate) ...	0·21	0·25
Total ...	100·00	100·00
Total, Nitrogen ...	·042	·025%

Partial analyses of representative soil samples obtained from the principal cultivated plots at the Partabgarh farm, 1907-8.

No.	Description.	P_2O_5 %.	K_2O. %.	N%.
48	No. I A, No. of fields 130-131, dumat (loam), sample of soil up to the depth of 9″.	0·20	0·36	0·042
49	No. 1 B, No. of fields 130-131, dumat (loam), sample of sub-soil up to the depth of 6″ below 9″.	0·21	0·48	0·025
50	No. 11 A, No. of field 119, clay, sample of soil up to the depth of 9″.	0·29	0·39	0·056
51	No. 11 B, No. of field 119, clay, sample of sub-soil up to the depth of 6″ below 9″.	0·31	0·51	0·022

Partial analyses of representative soil samples obtained from the principal cultivated plots at the Partabgarh farm, 1907-8—(concluded).

No.	Description.	P_2O_5 %.	K_2O. %.	N%.
52	No. 111 A, No. of field 41, dumat (loam), sample of soil up to the depth of 9″.	0·22	0·36	0·061
53	No. 111 B, No. of field 41, dumat (loam), sample of sub-soil up to the depth of 6″ below 9″.	0·25	0·34	0·069
54	No. IV A, No. of fields 57 and 58, Halki dumat (light loam), sample of soil up to the depth of 9″.	0·19	1·78	0·056
55	No. IV B, No. of fields 57 and 58, halki dumat (light loam), sample of sub-soil up to the depth of 6″ below 9″.	0·19	1·31	0·050
56	No. V A, No. of fields 247-248, bhur (sandy), sample of soil up to the depth of 9″.	0·19	0·97	0·039
57	No. V B, No. of fields 247-248, bhur (sandy) sample of sub-soil up to the depth of 6″ below 9″.	0·19	0·76	0·028
58	No. VI A, No. of field 95, bhur (sandy) sample of soil up to the depth of 9″.	0·17	1·50	0·044
59	No. VI B, No. of field 95, bhur (sandy) sample of sub-soil up to depth of 6″ below 9″.	0·14	1·06	0·019

Complete analysis could be conveniently made only in the case of loam which is the predominating class. In case of other soils the percentages only of phosphoric acid, potash and nitrogen, the chief fertilizing constituents, were determined.

(II) CHARACTER OF THE SEASON AND RAINFALL.

The year under report received a total rainfall of 48·53 inches at the farm or about 28 per cent. more than the average rainfall of the previous nine years. The following statement gives the detail of the rainfall:—

Name of month.	Average of nine years 1900-1 to 1908-9.	1909-10.
June	1·31	12·21
July	11·66	18·97
August ...	12·56	8·61
September ...	6·29	6·64
October ...	1·89	...
November ...	·05	...
December ...	·28	0·88
January ...	·57	0·52
February ...	·92	...
March	·20	...
April	·52	0·04
May	·31	0·66
Total ...	36·56	48·53

During the year under report the monsoon broke earlier than usual, the first shower being recorded on the 1st of June. In July the rains were heavy and the total amounted to 18·97 inches. The excess of rain during the month caused no little damage to some of the kharif crop. The seeds sown did not germinate owing to excessive moisture in the soil while crops in the earlier stages of growth were also damaged to some extent by water-logging. In August and September the rainfall was scarcely enough to meet the requirements of the standing crops. The months of October and November were rainless, but the moisture retained by the soil did not prove deficient for the purposes of rabi sowing. Winter rains though scanty were beneficial to the crops in general. The year was on the whole a very good one, specially for the rabi.

(III) KHARIF EXPERIMENTS.

(a) Cultivation of rice.

Five varieties of transplanted rice were tried at the farm. Two of them, viz. Bansmati and Hansraj, were originally imported from Pilibhit and the

remaining three, viz, Sambhalu, Joginia and Shiamghata, were procured locally. The seed sown was all acclimatized, having been produced at the farm in the previous year. The agricultural operations were similar in all cases. Three ploughings were given with the Watt's plough and one with the country. The fields were levelled twice with the wooden beam (pata). No manure was applied to the fields. The seedlings raised previously in nurseries were transplanted in the middle of July, a little earlier than usual owing to early commencement of rains. Bansmati and Hansraj are the best of the finer varieties grown in the district of Pilibhit and Sambhalu is one of the best varieties of South Oudh. All of these ripened early and were damaged to a considerable extent by the rice bug.

Shiamghata and Joginia which ripened late were not injured by the pest to the same extent.

The following is a statement showing the acreage outturn of the varieties :—

Statement showing the outturn of different varieties of late rice grown at the Partabgarh farm.

Serial No.	Names of varieties.	Area.	Outturn of each crop.	Outturn per acre.	Remarks.
			lb.	lb.	
1	Sambhalu of Sultanpur ...	·27	205	759	
2	Bansmati of Pilibhit ...	·31	125	403	
3	Hansraj of Pilibhit ...	·38	200	526	
4	Joginia of Sultanpur ...	·27	472	1,748	
5	Shiamghata of Sultanpur	·28	342	1,221	

During the year under report only one local variety of Kuari Dhan (early broadcast rice), viz : Mutmuri, was tried at the farm. The Banki reported last year, being less important, had to be given up owing to deficiency of suitable rice land at the farm.

The seed was sown under the " Leo " system soon after the commencement of rains, that is to say, the soil was prepared as quickly as possible at the advent of the monsoon rain and seed sown broadcast while the seed bed was practically under water. The crop had to be helped with artificial irrigation in the latter half of August when rainfall was scanty, and it was materially benefited by watering, which accounts for the good outturn obtained. The acreage outturn of the crop amounted to 1,463·9 lb. against 716·89 reported in the previous year.

(b) Introduction of maize in the locality.

Maize is very little grown in the district, and its introduction is desirable in order to secure greater diversity of cropping. The following experiments have been carried out to ascertain its suitability to local conditions:—

(1) During the year a plot was sown with Jaunpur maize before rains, the plot having been tilled after artificial watering, a method locally known as " paleva " or " phatakna."

(2) Another plot, No. 1 on the subjoined table, was sown with the same variety but after rains ; no manure having been applied in either case. Other varieties of maize, viz. *Chalanka* and *Air* of Meerut, yellow, red and white of Gonda, and local varieties of Ballia and Bareilly, were demonstrated on manured plots. The method of cultivation was alike in all cases. The seeds were dibbled with the khurpi in holes made on regular lines, one and a half foot apart from each other. The distance from plant to plant in each row was one foot : 12 lb. of seed was put in per acre. When the plants were about six inches high the thin and unhealthy seedlings were removed. Only the promising plants were allowed to grow ; one in each hole. The whole set of plots looked very luxuriant in growth and attracted the attention of the cultivators who visited the farm. The following table shows the outturn of the different varieties of maize grown at the farm :—

Statement showing the outturn of different varieties of maize.

Serial number.	Name of crop.	Area under each crop.	Outturn of each crop.	Outturn per acre.	Remarks.
		Acre.	lb.	lb.	
1	Jaunpur maize (sown after rain.)	·5	687	1,374	No manure applied.
2	Ballia maize ...	·5	760	1,520	Manured with sheep-dung.
3	Bareilly maize ...	·5	610	1,220	
4	Chalanka of Meerut ...	·125	194	1,552	
5	Air maize of Meerut ...	·125	205	1,640	
6	Red maize of Gonda ...	·125	218	1,744	
7	Yellow maize of Gonda.	·125	180	1,440	
8	Dudhia maize of Gonda.	·125	219	1,752	
9	Jaunpur maize (sown before rain).	·2	340	1,700	No manure applied.

NOTE :—The low outturn of No. 1 is due to the crop being damaged to some extent by water-logging in its earlier stages of growth.

It cannot yet be said with certainty which of the varieties is most suitable to the Partabgarh district, but so far the Jaunpur variety has done nearly as well without manure as others have done with manure so rich as sheep-dung.

(c) Cultivation of jute.

The suitability of jute to local conditions is being tested in comparison with sann-hemp—the chief fibre of the locality. Just after the commencement of rains two plots, the uniformity of which had previously been tested, were put under these crops. The agricultural operations carried out were alike in both cases.

The germination of jute, owing to excessive rains just in the beginning of the season, was defective. It had soon to be re-sown and the germination after the second sowing was good. But the plants in their early stage of growth suffered a great deal from the continuous rainfall, owing to which agricultural operations, such as weeding and thinning out could not be carried out in good time. The growth was consequently stunted; the stalks being only three feet high at the utmost. The resulting fibre was inferior in respect of color, glossiness, length and durability. The outturn was also poor.

The sann-hemp crop suffered equally from the excess of rain in the early season. Moreover when the plants were about one and a half foot high the crop was attacked by a disease locally known as *bondi*. The disease is characterised by the formation of a small ball in the terminal bud. When this happens the growth of the plant is seriously interfered with. At the base of this ball the plants begin to throw off new shoots whose development is also checked similarly by appearance of another ball of a similar character.

The crop was harvested at the usual time. The fibre produced was very poor in quality. The experiment will be repeated next year.

(d) Sugarcane.

The land in the neighbourhood of Partabgarh is naturally suitable for the cultivation of sugarcane. The white-ant is locally a troublesome pest; but in spite of the injury which is usually caused by this enemy the average outturn of *gur* obtained under the ordinary methods of cultivation is about 30 maunds to the acre. The department's efforts are directed in a measure to determining the most practical methods of combating the pests and so far it appeared that high cultivation is fairly effective. The varieties indigenous to the district are (1) Sarauti, a thin cane, and (2) Kuswar, a much thicker kind usually grown under more careful cultivation and yielding a comparatively high outturn of *gur*. The department has been experimenting at the farm on different varieties of surgarcane grown elsewhere which are specially famous for their sugar-yielding qualities, the object being to determine their relative merits as compared with the indigenous races.

The seed canes of the imported kinds came originally from districts in which each grows at its best.

The seed canes now employed for planting are all from the stock raised at the farm. The experiments above referred to are carried out in two sets of plots, each bearing sugarcane in alternate years.

Method of cultivation.

The fields meant for trial of the varieties were sown in the rains with autumn pulses, *urd* (Phaseolus radiatus) and *guar* (Cyamopsis psoralioides). After the harvesting of these crops they were watered once in order to facilitate ploughing. They were then ploughed and cross-ploughed with Watt's plough and four ploughings were given with the country plough, each ploughing being followed by levelling the fields with the Patela or Sarawan (flat wooden beam) : 150 maunds of farmyard manure was applied per acre. When the seed bed was ready cuttings of the whole cane, each about 18 inches in length, were planted after the usual manner behind the plough and the fields were levelled with the Patela.

Before the commencement of rains the crop was watered five times in all, each waterings being followed by two hoeings. The harvesting of the crop commenced in the last week of January.

Two years ago Mr. Clarke, Agricultural Chemist, planned an experiment to determine principally the number of cuttings which should most economically be used per acre for planting and for this experiment he selected the Reora of Benares.

During the year under report nine plots, each one-tenth of an acre in area, were set apart for his experiment. In the first four plots the number of cuttings used varied from 4,000 to 12,000 and in the remaining five plots from 12,000 to 24,000. The plots were planted up under his personal supervision. The chemical tests of juice for determination of sugar contents were carried out by Mr. Annett, officiating Agricultural Chemist. Besides the above 9 plots the juice of the Tanka and Katara varieties, both much taller and thicker than the best *ukh* canes but alleged to contain less sugar, was also chemically examined by Mr. Annett. The results of his determinations will be published separately as before.

Statements A and B are appended to indicate the outturns of (*a*) the different varieties of sugarcane tried at the station and (*b*) those obtained in the experiment started by the Agricultural Chemist to determine the economy of planting the various number of cuttings.

Two plots (Nos. 10 and 11 on statement B) of equal size were sown under similar conditions with *Patarki mango*.

One of them, viz. No. 10, was treated with ammonium sulphate at 300 lb. per acre. Plot No. 11 was left unmanured. The growth of the manured plot was more luxuriant than that of the unmanured. The former yielded 150 lb. of *gur* per acre more than the unmanured plot, hardly enough to cover the cost of the manure. The manurial effect of the mineral has been quite significant during the past years, but it is too early to pronounce an opinion upon the economic value of the manure, it being necessary to repeat the trials in both sets of plots for a series of years.

From the statement it will be seen that some of the plots have yielded more than 80 maunds per acre against 30, the local average. The average outturn of the farm during the year amounted to 59·8 maunds of *gur* per acre which would fetch about Rs. 319 per acre if sold locally at the current high rates.

Deducting the cost of cultivation, which amounted to Rs. 119 per acre, the net profit is calculated at Rs. 200 per acre. The financial results are thus highly satisfactory. It may be asked what their high outturns are due to. They are ascribed to deep tillage, selection of seed, timely watering and hoeing and general care in the management of the crop, but not to high manuring which has been intentionally avoided as impracticable in the existing conditions of the locality.

Prominent varieties of *paunda* cane imported from Lucknow and from the Agricultural station at Samalkota in Madras were planted during the year under report; all having done remarkably well. The cultivation of several varieties of Mauritius canes originally received from the managing agents of the Cawnpore sugar works was extended. All of these have given good results except the *Red Tana*, an extraordinarily thick variety, which develops a spongy pith containing little sugar. The station is now establishing a reputation as a sugar-growing centre of some importance, and during the year under report a considerable number of indents for seed canes, both for thin and thick races,

was received from these provinces as well as from outside. Part of the crop in the variety and the Agricultural Chemist's experiments alluded to before was utilized in training students of the special, sugar class, in trials of boiling-pans of new designs and in the manufacture of a very superior class of *rab* suitable for extraction of crystallized sugar.

A.—Statement showing the outturn of different varieties of sugarcane grown at the Partabgarh Farm in 1909-10.

Serial No.	Names of varieties.	Area in acres.	Outturn of *gur* in lb.	Outturn per acre in lb.	Remarks.
1	Mumcha of Basti ...	·181	513	2,728·7	
2	Sarauti of Basti ...	·143	448	3,132	
3	Dhaura of Azamgarh ...	·153	741	4,843	
4	Pansari of Yusufpur (Ghazipur) ...	·108	530	4,907·5	
5	Kuswar of Partabgarh ...	·18	816	4,533	
6	Reora of Benares ...	·20	1,137	5,685	
7	Hemja of Gorakhpur ...	·16	826	5,162·5	
8	Mutki Mango of Shahganj, district Jaunpur,	·10	491	4,910	
9	Patarki Mango of Shahganj, district Jaunpur,	·10	543	5,430	
10	Charkahia of Azamgarh,	·113	497	4,398	
11	Mutki Mango of Shahganj, district Jaunpur	·085	414	4,870·5	
12	Sonabeli of Dumraon Farm ...	·12	687	5,725	
13	Pansari of Yusufpur, district Ghazipur ...	·10	504	5,040	
14	Reori of Benares ...	·10	456	4,560	
15	Kewahi of Benares ...	·10	405	4,050	
16	Reora of Benares ...	·05	282	5,640	

B.—Statement showing the outturn of the experiment started by the Agricultural Chemist.

Serial No.	Names of varieties.	Sets.	Area.	Outturn of *gur*.	Outturn per acre.	Remarks.
			Acres.	lb.	lb.	
1	Reora of Benares	4,000	·10	532	5,320	
2	Ditto	6,000	·10	494	4,940	
3	Ditto	8,000	·10	683	6,830	
4	Ditto	10,000	·10	570	5,700	
5	Ditto	12,000	·10	502	5,020	
6	Ditto	12,000	·10	626	6,260	
7	Ditto	15,000	·10	598	5,980	
8	Ditto	18,000	·10	615	6,150	
9	Ditto	24,000	·10	652	6,520	
10	Patarki Mango of Shahganj ...		·10	558	5,580	Treated with ammonium sulphate
11	Ditto ...		·10	543	5,430	Unmanured.
12	Tanka		·007	40	5,714	
13	Katara		·007	39	5,571	

(f) Rabi Operations.

Those portions of the farm which have been sufficiently tested for evenness are under the kharif experiments detailed above. The rabi operations are devoted at present to testing other portions of the land, but two experiments may be mentioned.

Two plots of wheat forming part of the investigation of the Imperial Economic Botanist and the Economic Botanist to the United Provinces were grown. A preliminary account of these will be found in Volume III, No. 4 of the Botanical series of the Memoirs of the Department of Agriculture.

Controversies having arisen from time to time as to superiority of Muzaffarnagar wheat over the red *desi*, the two varieties were grown during the year at the farm side by side, on equal plots, under similar agricultural conditions. The outturn of the Muzaffarnagar was 100 lb more than that of the latter, a result which only confirms the conclusions arrived at in most instances before.

(9) *Reclamation of usar land by the use of gypsum.*

The Department has been engaged since 1907, in carrying out an important experiment on reclamation of usar land, by adequate applications of gypsum in a village known as Sarwanpur within a short distance of the Amethi Railway Station, the barrenness of the soil being due principally to the existence of sodium carbonate in excess. The history and progress of the experiment until last year are described fully in the report on the Partabgarh agricultural station for the last year. Briefly the programme consists of operations connected with two main plots. In one the top layer of one foot contained originally ·197 per cent. of the carbonate. The quantity of gypsum required per acre to neutralize the carbonate was 185 maunds which was applied in 1907. During the year under report this plot was prepared with the country plough for wheat in the usual manner and sown. The yield obtained was nine and a half maunds of grain and 14½ maunds of straw, which is nearly two-thirds of a normal outturn of land under ordinary wheat cultivation in Oudh. The corn was of a very fair average quality.

The cost of irrigation from a specially provided kachcha well rose to a high figure. The land was also manured sparingly with the ordinary cattle-dung. It was reported last year that the cost of gypsum ready for application came to Re. 0-14-6 per maund at Amethi. Since then the railway authorities have refunded a certain amount out of the freight owing to a concession originally agreed upon. The cost of the mineral has come down in consequence to Re. 0-12-3 per maund. Still it is prohibitive from an economical standpoint for reclaiming alkaline soils so as to render them fit for arable farming. In the second plot from ·26 to ·37 per cent. of sodium carbonate existed in the soil within a depth of four feet from the top. This plot was devoted to planting trees. Where the kankar bed was found within four feet, the holes for planting were dug only four feet deep: where however the kankar bed occurred lower down they were dug as much as six feet deep in order to break through the kankar layer. Holes of the former depth received 13 seers and those of the latter 19½ seers of gypsum which quantities were calculated to be sufficient to neutralize the maximum carbonate present in the soil dug out of the holes.

The soil when mixed with gypsum was returned to the holes and the thalas then planted up.

The trees put down in the previous year are all in good condition and look healthy. During the year under report 153 seedlings were planted in the manner described above. Of these 39 were shisham (Dalbergia sissu), 11 mahuas (Bassia latifolia) and three nim (Melia Indica). The growth of all trees has been very satisfactory so far. The shisham trees of the past year have shown a tendency to throw off too many branches from the trunk. They were consequently all pruned in the past cold weather and ought now to grow most vigorously.

The trees so far planted are all in a promising condition.

The cost of gypsum in the case of four feet thalas is about four annas, and in other case about six annas, which is not excessive, considering the class of valuable timber trees which we are endeavouring to grow. The plot at Kusha reported in the previous year was abandoned during the year under report for want of proper water-supply which is a desideratum for experiments with gypsum.

(h) Utilization of the ravines near the river Sai.

An experiment of some practical interest is being conducted near Chilbila junction, Oudh and Rohilkhand Railway, on ravine land liable to erosion by drainage water during the rains. The plan is to make embankments, at suitable distances within the area liable to damage by the natural flow of rain water so as to direct the course of the water in different directions and prevent undue erosion in the embanked plots, the silt held in suspension being thus allowed to settle down. The progress made till the end of June 1909 has been noticed in the last report, a

description of which will be only a repetition of the same narrative. In the month of July 1909, the plots were ploughed with improved ploughs and were again sown with bajra, juar, and arhar. No manure of any kind was applied to these crops. The outturn was very poor, owing mainly to the sandy nature of the soil and deficiency in fertilizing ingredients. In one of the plots which was very uneven and is situated at one of the extremities of the embanked area where erosion is usually most marked, 17 mango and 21 mahua trees have been planted in holes under the "deep-thala system." These trees are in very good condition. The experiment is watched with great interest by the neighbouring cultivators.

According to the determinations made at the close of the year, the amount of silt deposited in portions of the embanked area varied from three to ten inches.

PARTABGARH:
The 29th October 1910.

S. M. HADI, KHAN BAHADUR, M.R.A.C., M.R.AG.S.,
Assistant Director of Land Records and Agriculture, United Provinces.

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